Electricity Generation Using Dynamic Bifacial Solar Panel Using IoT

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Abstract- *Recent developments on Bifacial Photovoltaic (PV) modules have captured a significant amount of attention as this technology is becoming more affordable and is able to produce more output compared to the traditional monofacial solar panels. The advantage of this technology comes from its ability to absorb additional irradiance from the rear which the monofacial panel is in capable of. Bifacial photovoltaic (PV) is a renewable energy technology that can increase the power density by harvesting both incident and albedo radiation. Integration of these resources into the power grid can offer benefits including improved energy efficiency and power continuity. The Bifacial modules mounted flush to a rooftop block any reflected light from reaching the backside of the cells. That's why bifacial modules perform better on flat commercial rooftops and ground mounted arrays, because there is more room for tilt and bouncing reflected light to the rear of the modules. This paper examines the performance of bifacial solar panels in the real-time climate of Qatar under winter and summer.*

This paper contains even though in the dull sunlight it generates the electricity. The four LDR are used observes the sunlight and generates the electricity in the PV panel. In this project two DC gear motors were connected in that PV panel one for to rotate the panel and another one for up and down purpose This paper will also enhance the feasibility, reliability and efficiency of the system.

Keywords- PV Panel, DC gear motor, LDR, LCD Display, PIC microcontroller, DC-DC Inverter.

I. INTRODUCTION

The global growth of photovoltaic (PV) cells has been exponential for the last 25 years. The usage of PV technology has evolved from a market of small scale applications to become a commonly used energy source in large parts of the world. As a result of the increasing demand, the development of PV has evolved rapidly and lowered the production costs. [1] This has enabled fairly unrecognized PV technologies to become more implemented. One of these technologies is Bifacial PV. Bifacial PV is a technology that produces power from radiation striking the front, as well as the rear side of the module. This gives the module a higher energy output potential than a standard one, without covering any more physical area. Since the main feature of a Bifacial panel is its ability to absorb radiation reflected on the rear side, the albedo of its surroundings is of high importance. Research studies have shown that modules installed on high reflective surfaces can produce 5-30 percent more than a standard module. [2] The Bifacial technology is becoming more recognized globally, however it has not yet been implemented at any large scale in Sweden. One company currently looking into the potential of this technology in Sweden is the energy consultancy company Stuns. Stuns is based in Uppsala Science Park where they have, in cooperation with Region Uppsala, installed a PV system consisting of both standard and Bifacial solar cells. The system has been operational since the beginning of November 2017 and due to it being so new, most of the data has not been thoroughly analyzed. [3] This report aims to analyze the data from the system in Uppsala Science Park to compare the power and energy outputs of the Bifacial panels to the standard ones. It will also investigate how different parameters can enhance the additional energy yield of bifacial modules, focusing primarily on the albedo. This study will examine the potential for Bifacial PV in Sweden, and whether investing in this technology is financially reasonable. This will be done by running simulations overlooking various financial aspects.

II. SYSTEM ANALYSIS

The design of these bifacial solar panels involves a glass-to-glass structure which makes it possible to capture the incidental reflective sunlight from the rear end along with the direct sunlight from the front surface. This allows them to produce more energy than regular modules. It's been observed that these solar panels produce up to 30% more energy than the conventional monofacial solar cells of the same area. So, if the monofacial panel is giving an output of 30kWh in a month, it can be sure 32kWh, or more, per month, switch to bifacial panels.

Moreover, the silicon that is used in these bifacial solar panels is of much superior quality as compared to that used in monofacial solar panels. Because of this, there is a smooth flow of the photo-generated electric charge from the rear surface towards the 'emitter' on the front surface.

Furthermore, the composite glass encapsulation of bifacial solar panels ensures higher durability, minimal degradation, and maximum service life. The structure is designed to protect the panel from environmental and mechanical damages.Solar panels will provide more electricity as their efficiency improves. Because the panels produce more watts, the number of solar panels on the roof is reduced. It is possible to use larger, less efficient panels at a cheap cost when the roof area is large. There are several factors to consider when choosing the right panels for a small roof area.

Similar solar systems may produce various quantities of energy depending on the quality and efficiency of the system. Because the days are longer and the sun is higher in the sky during the summer, the same system can create twice as much electricity. Solar panels work and create electricity during daylight hours in the spring, summer, winter, and fall. The amount of solar power created, on the other hand, changes greatly throughout the day and over the seasons.

III. PROPOSED METHODOLOGY

Solar energy is an excellent source of alternative energy because it is renewable, Economical, It does not pollute the environmental and infinite form of energy. In this project the bifacial solar panel rotate 360 degree with the help of DC gear motor. Bifaciality is a strategy in which the solar modules can harvest direct sunlight as well as to albedo – the light reflected from surrounding ground surface, which is usually uncollected in monofacial modules. The purpose of this paper is to produce electricity in dynamic bifacial solar panel with the help of LCR(4 LCR's) in cloudy weather. In this concept, the LDR's work is to measure the density of sunlight. The density of sunlight is maybe low or high. But with the help of DC gear motor it turn the panel and generate the power. It will be more efficient than static up and down bifacial solar panel. It produces more electricity from sunlight to fulfill the needs.

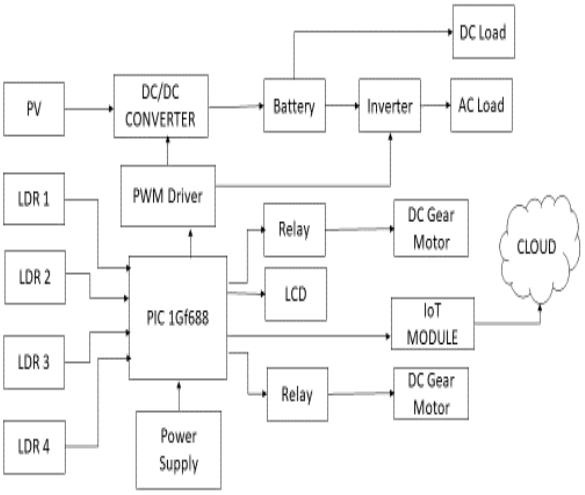

Figure1.BlockDiagram

IV. SYSTEMDESIGN

The quality and efficiency of solar panels play a vital role in determining the total quantity of solar panels. Another feature is micro inverters, which can maximize power conversion at the source. Some panels absorb more sunlight, while others are thicker and more resistant to cracking and corrosion.Solar panels will provide more electricity as their efficiency improves. Because the panels produce more watts, the number of solar panels on the roof is reduced. It is possible to use larger, less efficient panels at a cheap cost when the roof area is large. There are several factors to consider when choosing the right panels for a small roof area.Similar solar systems may produce various quantities of energy depending on the qualityand

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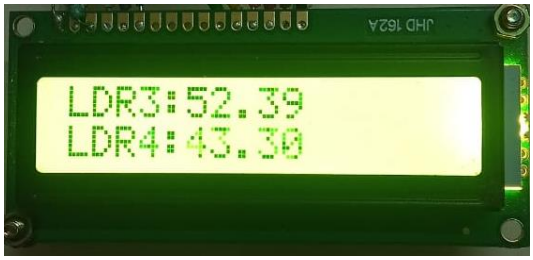


V. EXPERIMENTALSETUP

In this paper the solar panel connect with fourLDR's to rotate and change the position. First two LDR is used to change the position of the panel and another two is used to rotate the panel which direction the sunlight density is high.it also rotate the panel 360 degree. The protection diode is used

to protect the panel from reversing current.While we connect the system with our phone it shows the LDR data in the form of graphical method.

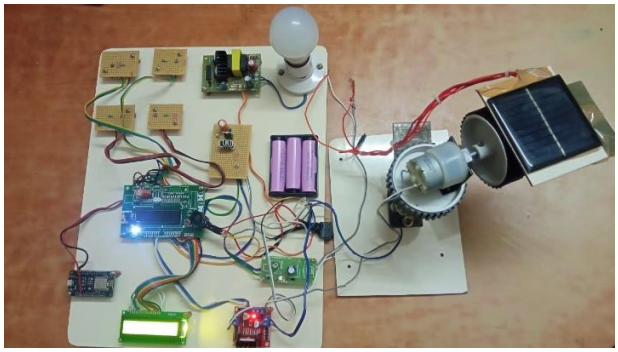


Figure 2.Snapshot Of Proposed Hardware Kit

Figure 3.Measured Voltage Level Of The PV panel

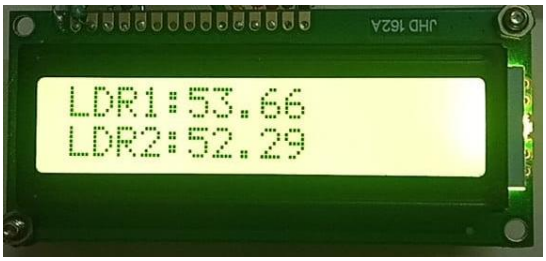


Figure 4. Data's Of LDR's

S.NO	PARAMETERS	EXSITING SYSTEM	PROPOSED SYSTEM
1	WORK OF PV PANEL	work in good sunlight condition.	Work in cloudy session
2	EFFICIENCY	Medium	High
3	STATE OF SOLAR PANEL	Static solar panel	Dynamic solar panel
4	THENIQUE USED	IoT not interfaced.	IoT interfaced.
5	TYPE OF MOTOR USED	AC motor is used	DC gear motor is used

Table.1 Comparison of proposed system with existing system

Status of Bifacial PV

Bifacial PV is entering the market quickly as the modules are available at the same cost as their monofacial equivalents. This is because bifacial cells are an evolutionary process of c-Si device development and because module manufacturers are, regardless, increasingly switching to double-glass modules to increase the duration of product warrantees. The measured voltage level of the PV panel voltage is shown in figure.3. The graphical view of the measured voltage level of the PV panel as shown in the figure 5.

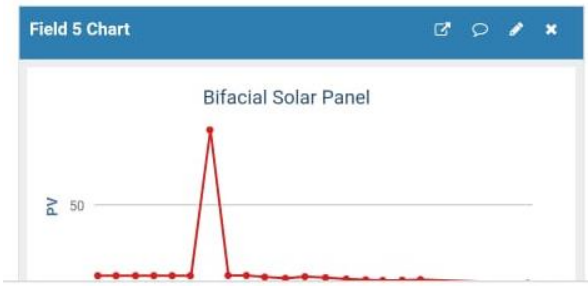
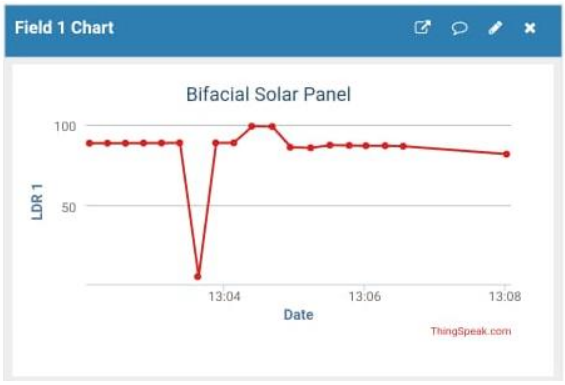


Figure 5. Graphical View ofthe PV System.

Status of LDR

Frequently the LDR's measures the density of the solar panel. While connecting the system to our phone it shows the data and also see the data in the form of xls format.Results and studies have shown that bifacial modules can produce additional power between 10-20% over monofacial panels. If conditions are optimized and single axis trackers adopted, the additional power can be as high as 30-40%.

It is important to bear in mind that we are looking for the optimum LCOE (levelized cost of electricity), not the maximum power possible.



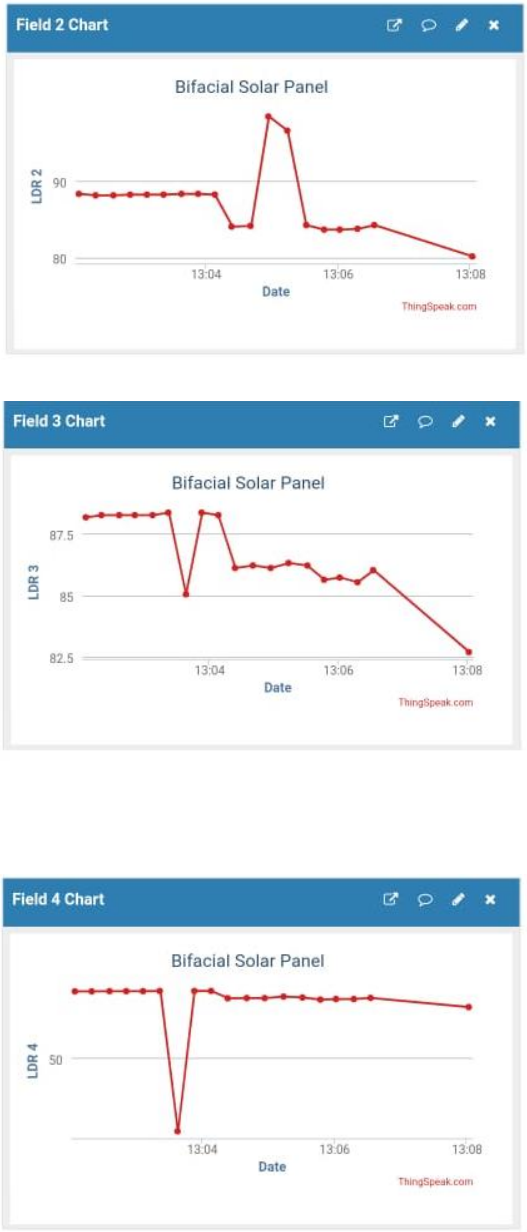


Figure 6. Graphical View of the LDR's Data Stored Values.

VI. RESULT AND DISCUSSION

	A	B	C	D	E	F
1	created_at	entry_id	field1	field2	field3	field4
2	2023-04-27T07:3	1	88.26	88.36	88.17	84.84
3	2023-04-27T07:3	2	88.26	88.17	88.26	84.84
4	2023-04-27T07:3	3	88.26	88.17	88.26	84.94
5	2023-04-27T07:3	4	88.36	88.26	88.26	84.94
6	2023-04-27T07:3	5	88.36	88.26	88.26	84.94
7	2023-04-27T07:3	6	88.46	88.26	88.36	85.04
8	2023-04-27T07:3	7	6	88.36	85.04	12
9	2023-04-27T07:3	8	88.46	88.36	88.36	85.04
10	2023-04-27T07:3	9	88.46	88.26	88.26	85.04
11	2023-04-27T07:3	10	98.72	84.06	86.11	81.23
12	2023-04-27T07:3	11	98.53	84.16	86.21	81.32
13	2023-04-27T07:3	12	85.72	98.53	86.11	81.32
14	2023-04-27T07:3	13	85.43	96.67	86.31	82.11
15	2023-04-27T07:3	14	87.09	84.26	86.21	81.62
16	2023-04-27T07:3	15	86.9	83.67	85.63	80.54
17	2023-04-27T07:3	16	86.7	83.67	85.72	80.84
18	2023-04-27T07:3	17	86.7	83.77	85.53	80.84
19	2023-04-27T07:3	18	86.41	84.26	86.02	81.42
20	2023-04-27T07:3	19	81.52	80.15	82.69	76.63

Figure 7. LDR's Data's View in Xls Format.

Results and studies have shown that bifacial modules can produce additional power between 10-20% over monofacial panels. If conditions are optimized and single axis trackers adopted, the additional power can be as high as 30-40%.

It is important to bear in mind that we are looking for the optimum LCOE (levelized cost of electricity), not the maximum power possible. The system's working lifetime Is increased by the properties.

From the experimental set up see the data's stored in LDR;s in format of data entry sheet. The shared values are stored in the cloud with the data Id respect to date and time.

The field values are LDR's data values as shown in the figure 7.

VII. FUTURESCOPE

It increasing the use of solar energy, that renewable energy generation might increase from 18% to 44% by 2029-30 in the country. India aims to portray a "green" environment with rooftop solar systems in all Indian households.In future, it is help to make innovative solar produces like solar car , solar windows , solar road.

VIII. CONCLUSION

The proposed of the system tells that by capturing light from the surface beneath the module and from the environment.it using direct and diffused light. **B**ifacial technology is already in the market but there are still opportunities to improve different key aspects in the cell, modules and system level. To improve this technique must invest more money and further develop and perfect the technology at the hand.

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